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Handwriting success for school: a professional development program for early childhood educators by occupational therapists

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HANDWRITING SUCCESS FOR SCHOOL:

A PROFESSIONAL DEVELOPMENT PROGRAM FOR

EARLY CHILDHOOD EDUCATORS BY OCCUPATIONAL THERAPISTS

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ABSTRACT

Early childhood is a time to build the foundational skills that are needed to be a successful learner in primary school. Preschool students in Singapore are expected to be able to write their name and the letters of the alphabet with appropriate speed by the end of kindergarten (MOE, 2013). However, there is a gap in common standards and handwriting instruction practices among early childhood educators (ECE) in Singapore. Teaching handwriting explicitly improves handwriting legibility and fluency, and direct handwriting instruction is especially important for children who are at-risk of challenges in writing and reading (Berninger et al., 2006; Satangelo & Graham, 2016).

A student's handwriting fluency and legibility is predicted by teacher competence in providing handwriting instruction (Graham et al., 2008). Evidence shows that teachers feel they are insufficiently prepared in teaching handwriting to their students, are not equipped to identify fine-motor delay in children and lack the knowledge to help the children in their class who are struggling to learn to write (Whermann, et al., 2006; Graham et al., 2008; Donica et al., 2012).

The proposed professional development program entitled *Handwriting Success for School* is a professional development program by occupational therapists for ECE. The program aims to increase the knowledge, confidence and competence of ECE in Singapore to teach handwriting and support children who show difficulties mastering handwriting skills. The content and design of the program is developed following a thorough literature review on effective professional development for teachers. Principles of Adult Learning Theory (Knowles, 1977) and Collaborative Consultation model (Idol, Paolucci-Whitcomb & Nevin, 1995) guide the development of the design of the program.

When teachers collaborate with occupational therapists in addressing handwriting acquisition and intervention for their preschool students, teachers feel supported to help struggling students (Fancher et al., 2018). Occupational therapists, with their knowledge and expertise in neurodevelopment and sensory-motor development makes them key professionals in training teachers to teach handwriting (Donica, 2015). By increasing ECE's understanding of the importance to practice the evidence-based principles of handwriting instruction, it will lead to better student outcomes in their handwriting development at the preschool level.

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LIST OF ABBREVIATIONS

AECES ..... Association of Early Childhood Educators Singapore

CPD ..... Continuing Professional Development

DSLS ..... Development Support Learning Support Program

ECDA ..... Early Childhood Development Agency

ECE ..... Early Childhood Educators

LSEd ..... Learning Support Educators

NIEC ..... National Institute of Early Childhood Development

PD ..... Professional Development

CHAPTER ONE: INTRODUCTION

Nature of the Problem

Handwriting is a fine-motor skill that requires an integration of perceptual, motor and cognitive processes (Maldarelli et al., 2015). Even with the increase of the use of technology in school, teachers still prefer the medium of handwriting for students to show learning and understanding and is still considered a main occupation of students in school (McMaster & Roberts, 2016). Teaching handwriting early leads to better literacy and academic outcomes in later schooling years (Suggate et al., 2019). Research suggests that fine motor skill is a school readiness indicator that share similar processes with the development of cognitive and academic skill (Suggate et al., 2019).

Kindergarteners with better fine-motor skills, particularly design copy performance, achieve better academically (Cameron et al., 2012).

Kindergarten children who are able to copy forms and write letters are in a better position to use their attention to focus on higher literacy skills such as reading words and sentences (Cameron et al., 2012). Children who struggle to hold a pencil may have difficulties progressing quickly in cognitive tasks such as decoding longer words, reading for comprehension, and connecting letters with their sounds likely because they have to attend to the motor movements when forming their letters (Cameron et al., 2012).

Children who were rated to have poor handwriting were slower at completing their work in comparison in children who had good handwriting (McCarney et al., 2013) and had lower IQ score, reduced working memory capacity and lower scores for reading and spelling. The authors reason that these children had not yet reached a level on

handwriting automaticity to free the children to focus on the content of the educational task.

The benefits of teaching handwriting explicitly include improved handwriting legibility and fluency and word reading skills (Berninger et al., 2006; Satangelo & Graham, 2016). Addressing handwriting fluency enables the student to be able to focus on writing processes such as content generation and sentence construction as these students are better able to hold their ideas in their working memory while they are transcribing their ideas into written text (Satangelo & Graham, 2016). This is especially important for at-risk students who are slower at mastering handwriting than their peers because explicit handwriting instruction is shown to improve their ability to acquire the skills for text transcription (Graham et al., 2018). In view that explicit handwriting instruction is beneficial to children's academic success, even more so for children who struggle to master handwriting, are teachers providing regular handwriting instruction in their classes?

The method in which teachers support handwriting acquisition and proficiency is important to their students' ability to develop the skill from a neurodevelopment perspective (Fancher et al., 2018). It is recommended that to achieve effective handwriting instruction outcomes, handwriting instruction by the teacher should be regular and children should be given spaced practice daily or several times a week (Graham et al., 2008). With evidence on effective handwriting instruction practices, teachers were found to still struggle to apply these practices into their class. In a study by Graham et al. (2000), the authors found that the majority of the teachers were irregularly

teaching handwriting and at most, were only teaching handwriting on a weekly basis. Only three out of twelve teachers provided additional handwriting instruction for children who were weaker. In addition to a lack of dedicated teaching hours for handwriting, another study found that teachers did not differentiate their instruction for children who were struggling with writing which may suggest that teachers may not also differentiate their instruction for children who have difficulties with basic handwriting (Graham & Harris, 2005). Handwriting efficiency appears to be an underestimated performance factor by teachers when they teach writing to young children in mainstream education (Medwell & Wray, 2008).

Factors that contribute to teachers' decreased priority and time in teaching handwriting in her class include the perception of teachers about handwriting, teacher's training and competence in providing handwriting instruction to her class. In a survey of handwriting instructional practices of primary grade teachers by Graham et al. (2008) had found that student's handwriting fluency and legibility was predicted by the teacher's attitudes toward teaching handwriting and their perceived level of competence in providing handwriting instruction. The teacher's perception about handwriting development appears to contribute to the amount of time she spends teaching handwriting in her class. Although the teachers generally felt that direct instruction was more important than incidental learning with regards to handwriting, there was variability in how teachers provided handwriting instruction in their class (Graham et al., 2000; Graham et al., 2008). When there is variability in in the nature of the teacher's instruction, handwriting outcomes of the students vary as well (Malpique et al., 2017).

This variability in handwriting instruction could be attributed to teachers feeling that there is insufficient time to provide handwriting instruction in light of the other curriculum goals they need to achieve during the school hours (Nye & Sood, 2018). Although teachers desire to spend more dedicated curriculum time on handwriting instruction to provide mastery of handwriting skills, teachers felt that they had to choose to focus between teaching the basic skills of handwriting or teach writing during the literacy class (Hammerschmidt & Sudsawad, 2004; Malpique et al., 2017; Sharp & Brown, 2015).

In addition to the perception of teachers about handwriting instruction, the training and competency of teachers to teach handwriting is an important factor. Teachers need to be equipped to teach handwriting and more importantly, help students who are struggling to develop the skill. A study on first-grade teachers found that teachers perceive that they did not have sufficient strategies to help children who were struggling to learn to write (Schoenfeld et al., 2009). Both teachers and faculty of education programs acknowledge that training for handwriting instruction is important and that education programs are not adequately preparing the teachers in providing handwriting instruction (Donica et al., 2012; Hart et al., 2010). This lack of instructional knowledge could weaken the quality of teacher's handwriting instruction (Graham et al., 2008).

Importance of Addressing the Problem

Therefore, in view that teachers perceive they have insufficient training in teaching handwriting and currently there is variability in the way teacher provide handwriting instruction, there is a gap in the teacher's knowledge and capability in

providing handwriting instruction to their students. Bridging this gap would be important to ensure that kindergarten children can be provided equal opportunities to develop handwriting skills across preschools. In addition to improving teacher's capability to provide handwriting instruction, teachers also desire to learn how to identify children with fine motor difficulties and to have strategies to help the children who have difficulties (Wehrmann et al., 2006; Graham et al., 2008; Donica et al., 2012). This is because teachers feel insufficiently prepared to identify fine-motor delay and help the children in their class who are struggling to learn to write (Wehrmann et al., 2006). Teachers want improved access to professional advice by occupational therapists so that children can be identified and supported earlier (Wehrmann et al., 2006).

Approach to Address the Problem

Occupational therapists are key professionals in advocating for the development of the fundamental motor skills that preschool children require to prepare them for academic achievement and can help teachers increase their understanding of foundation skills needed for handwriting (Nye & Sood, 2018). Occupational therapists are able to collaborate and provide consultation in teaching handwriting skills (Donica, 2015) and in developing and/or implementing supplemental instruction if the child does not respond to Tier One level of instruction in the response to intervention approach (Donica, 2010). The knowledge and skill set of occupational therapists in neuromuscular and sensory-motor background can assist teachers in all three levels of the tiered approach (Donica, 2010; Donica et al., 2012). Occupational therapists can provide expertise in developing training modules for teachers as teachers may not have the knowledge base to assist

students who need more support in developing handwriting skills (Donica, 2010). Occupational therapist equally feel it is important to be involved in increasing the teacher's competency in helping the student's master handwriting (Giroux et al., 2012).

In a study by Christner (2015), which aimed to study elementary teacher's knowledge and understanding of school-based occupational therapy, found that teachers want occupational therapists to provide ongoing education and in-service training to help support educators in classroom instruction and strategies that can promote student success. When teachers were given the opportunity for professional development regarding occupational therapy, it helped in promoting collaboration between the OT and the teachers towards supporting student success in school (Christner, 2015). The benefits of collaboration between occupational therapists and teachers is further supported in a systematic review of handwriting acquisition and intervention of pre-K to second graders. Fancher et al. (2018) found that the use of collaborative approach by the occupational therapist had helped teachers support their students in improving their handwriting.

In view that occupational therapists are key professionals in educating teachers to support students struggling to master handwriting, the intended professional development program for Early Childhood Educators (ECE) entitled *Handwriting success for school* will target increasing the knowledge and capability of the ECE to be able to identify children who are struggling to master handwriting and provide targeted help to these children. The program entails in-service workshops followed by a consultation period by occupational therapists to support the teachers in translating their knowledge into the classroom for their students.

Challenges in Addressing the Problem

Barriers to addressing the problem include challenges with the practice patterns of occupational therapists and the challenge to collaborate with teachers. Bolton and Plattner (2019) surveyed teachers and occupational therapists about their perceptions and value of the occupational therapist role in the classroom and their findings showed a difference in the perceptions of the occupational therapist role between the teachers and the occupational therapist. Although the teachers placed high value on the contribution of the occupational therapist in the classroom, teachers felt that the occupational therapist could be more involved in the classroom and in engaging the teachers (Bolton and Plattner, 2019). Generally, teachers want more collaboration and regular interactions with the occupational therapist (Benson et al., 2016; Christner 2015; Ren & Joosten, 2014; Wintle et al., 2017). In the daily bustle of direct intervention, occupational therapists may not be spending sufficient time in the classroom to work collaboratively with the teacher (Case-Smith & Cable, 1996). It is no wonder occupational therapists face challenges ensuring therapist-suggested strategies were implemented (Cram & Egan, 2015). The reality is that teachers want strategies that can be implemented in the classroom and preferably with the whole class (Ren & Joosten, 2014). There is emerging evidence that consultation with teachers in handwriting instruction is effective in helping the students generalize learnt handwriting skills back in the classroom (Fancher et al., 2018). Therefore, the follow-up consultation period after the in-service workshop in the intended program would be key in working with the teachers in applying the strategies back into their classrooms.

When Cram & Egan (2015) studied the practice patterns of Canadian school-

based occupational therapists in targeting handwriting, their findings showed that a majority of therapists still use a bottom-up approach, targeting the sensory, motor-coordination or visual-perceptual components even though current best evidence show that a skills-based approach, focusing on handwriting rather than underlying motor and perceptual components, improves handwriting performance. These approaches, often delivered in direct pull-out intervention sessions, could be ineffective in remediating handwriting difficulties (Cram & Egan, 2015). The authors rationalized that one reason occupational therapists continue to use bottom-up approaches, in spite of knowing evidence of best practice, is because they may be limited to system barriers such as intervention funding. To encourage a shift in practice patterns of school-based occupational therapists, funders and program administrators can lower the barrier by supporting the occupational therapist in terms of time and resources so that they are enabled to take time to collaborate and consult with teachers in the general classroom (Cahill et al., 2014; Villenueve & Shulha, 2012). With the increasing evidence of the effectiveness of a collaborative consultation approach with teachers (Donica, 2015; Ohl et al., 2013; Randall, 2018; Reid et al., 2006; Whermann et al., 2006), the intended program is one step towards enabling occupational therapists in Singapore to adopt this approach in working with our local ECE to address handwriting instruction.

Conclusion

Handwriting is still a relevant occupation for children in school in this age of technological advances. Therefore, there should be continued emphasis in helping children master the skill of handwriting in school. Literature on teacher perceptions of

their training in handwriting instruction show that generally teachers feel insufficiently prepared to teach handwriting or help students who may need more help mastering the skill. The training and expertise of occupational therapists make them key professionals in bridging this knowledge gap and can partner teachers in increasing their quality of handwriting instruction and supporting children who have difficulties developing handwriting skills compared to their peers. The intended program entitled *Handwriting Success for School* is a professional development program for early childhood educators by occupational therapists. The program combines traditional professional development for teachers with a period of consultation by occupational therapists to help teachers translate their knowledge to their classroom. Theoretical and conceptual frameworks from the fields of occupational therapy, handwriting instruction, professional development for teachers and Adult Learning Theory were identified to shape and guide the program.

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CHAPTER TWO: THEORETICAL AND EVIDENCE BASE

Theoretical and Conceptual Frameworks

Theoretical and conceptual frameworks guide the development of the proposed program, *Handwriting Success for School*, for the identified problem described in Chapter One. A thorough review of the evidence literature identified Adult Learning Theory as an appropriate framework of professional development in teachers. Adult Learning Theory was also found to be an appropriate framework in the Collaborative Consultation model which guides the consultation aspect of the intervention. The Collaborative Consultation model was found to be effective in encouraging change of practice in Early Childhood Educators (ECE).

Adult Learning Theory

As adults differ from children in many aspects, the approach and purpose of why adults engage in learning differs as well. Adults' learning needs and interests are different from children as they are at a life stage where their learning revolves around their social roles and the responsibilities that come with the roles they perform (Merriam & Bierema, 2014). Additionally, adults have more life experiences than children therefore teaching adults would be different from teaching a child, who in comparison, has less life experiences. Therefore, andragogy is the "art and science of teaching adults" (Forest III & Peterson, 2006, p. 114). Malcolm Knowles developed the contemporary concept of andragogy in 1968 by presenting a framework of adult education, strongly proposing for a change in adult education principles (Forrest III & Peterson, 2006). The andragogical model of adult learning has humanist roots where the individual is assumed to be

internally motivated and self-directed in their pursuit of learning (Merriam & Bierema, 2014). Adults engage in self-directed learning for self-fulfillment, problem-solving and greater competency in life roles (Merriam & Bierema, 2014). In essence, andragogy is defined as the art and science of helping adults learn (Knowles, 1977). There are six assumptions of how adults learn which are (Knowles, 1977; Merriam & Bierema, 2014):

1. Adults are self-directed in their learning because they have an independent self-concept compared to young children.
2. Adults use their life experiences as a rich resource for learning – life experiences are accumulated in the life roles they engage in at current.
3. The adult's readiness to learn is closely linked to the developmental tasks of his/her social role. The current social role creates a need for learning to be able to engage in the role.
4. Adults prefer a problem-centered approach over a subject-centered approach in learning because of a developmental maturity from future application of knowledge to immediacy of application. Adults desire immediate application of the knowledge learned.
5. Adults are mostly driven by curiosity and internal motivation to learn.
6. Adults need to know the reason for learning something.

Adult Learning Theory in Teacher Professional Development

Professional Development (PD), as defined in the Continuing Professional Development Framework for Early Childhood Educators, is a lifelong process of learning where teachers take personal responsibility in developing and maintaining their

knowledge and skills for professional competency (Ching-Kwan & Heng, 2013). PD for teachers has a positive impact on teacher's self-efficacy and on student outcomes (Egert, Fukkink & Eckhardt, 2018). Teachers should be viewed as active participants rather than passive recipients of their professional development and this reflects the first assumption of Adult Learning Theory which is adults are self-directed in their learning pursuit. It is in a teacher's nature to be problem-solvers by attribute, as they question, challenge and adapt their instructions to their student's needs (Beavers, 2009). In helping teachers to be active participants, Beaver (2009) proposes that the purpose and benefit of PD be made clear by PD providers so teachers are able to see the direct application of the information to their practice. Additionally, the autonomy to engage in learning further adds to the internal motivation of teachers to engage in self-directed learning (Beavers, 2009).

The second assumption of Adult Learning Theory is that adults use their life experience as a rich resource for learning (Knowles, 1977; Merriam & Bierema, 2014). The use of life experience can be used as a start to connect the teacher's experience with the new concept, theories and experiences. In the study by Ruey (2010), the author found a difference in learning needs between younger and older adults. Older learners were contented to learn new concepts and knowledge but were more interested in reading their peer's experiences, opinions and ideas. On the other end, the younger learners placed more value in attaining useful knowledge which would allow them to connect theory to practice. This finding may suggest that older learners are likely to prefer using experience as a resource in learning whereas younger learners, having less life experience than older learners, desired to know more on the application of theory to practice as they as had less

personal experience to fall back on (Ruey, 2010). Regardless of life experience, learners can be supported to draw on their life experiences as resources for learning through activities such as embedded discussions, role play, simulations, problem-based learning and the use of case studies (Merriam & Bierema, 2014).

Experience may also have an effect on the teacher's choices to engage in PD. The third assumption of adult learning theory is that the adult's readiness to learn is closely linked to the developmental tasks of his/her social role (Merriam & Bierema, 2014). In a study conducted by Louws, Meirink, van Veen & van Driel (2017) with Dutch teachers, the authors aimed to study if the teacher's learning needs, arising from the differences in their teaching experience, would affect how teachers choose to self-direct their learning in the workplace. With the use of questionnaires, the authors found differences in choice of learning topics between the early-career, mid-career and late-career teachers. The "teachers varied in what, how and why" (Louws et al., p. 174) they would engage in PD. In the study, all the teachers preferred learning about subject matter-specific domains because they wanted to stay relevant in their knowledge and skills. Early- and late-career teachers showed a stronger preference for learning about learning climate and classroom management more than mid-career teachers. Early-career teachers were concerned about "mastering all aspects of classroom teaching, including organising their classroom and developing subject pedagogies" (Louws et al., p. 180). All the teachers in the study prefer to self-select the learning domain because of intrinsic reasons such as interest and/or it is a topic they feel is important to learn about. The study findings support the assumption that adults are driven by curiosity and motivation to learn (Merriam & Bierema, 2014).

Training teachers on evidence-informed handwriting instruction practices provides the opportunity for teachers to increase their ability to support their students who may be experiencing difficulties in acquiring and mastering handwriting skills.

PD can be provided in the form of in-service trainings for teachers with training focus often on general instruction practices or content-specific programs such as social-emotional training, teaching literacy, encouraging students to read, instructional practice in mathematics or handwriting instruction (Naeghel et al. 2016; Schacter et al., 2015). Egert, Fukkink, & Eckhardt, (2018) had conducted a thorough meta-analysis to evaluate the impact of in-service programs for ECE by exploring the possible mechanism that influence the results to inform future program for ECE. The authors studied the impact of the in-service programs on teachers, characteristics of effective program components and the link between the program on student outcomes as a result of a change in the teacher's practice. The overall findings of the meta-analysis showed that PD for ECE improves the quality of pedagogical practice which in turn, improves developmental outcomes in young children (Egert, Fukkink, & Eckhardt, 2018). Other findings from the analysis found that in-service training was beneficial to all teachers regardless of their qualifications and that coaching was an effective element in comparison to PD programs that did not include coaching. Generally, PD programs showed positive results in changing classroom practice. In view that in-service PD aims to enhance the abilities of teachers in schools, particularly programs with a coaching element in the design, there is an opportunity for occupational therapists to contribute in the professional development of teachers in using practices that are developmentally appropriate and evidence-based in

teaching handwriting. Additionally, occupational therapists can contribute to increasing the ability of teachers in providing a primary level of prevention in the classroom by increasing their knowledge and skill in supporting children who show difficulties in learning handwriting.

Coaching in Teacher Professional Development

Coaching is an effective model of follow-up support in professional development for teachers as it promotes the transfer of high fidelity of evidence-based practice from the training to the classroom (Kretlow & Bartholemew, 2010). Coaching is a process where the individual being coached, i.e. the teacher, receives encouragement and support to reflect on their practice, develop a plan to address challenges and implement the plan in improving their class instruction. The coach is often an expert who individualizes the support to the teachers after a training with the purpose of encouraging a translation of knowledge to practice after the training (Kretlow & Bartholemew, 2010). Successful coaching focuses on professional practice, is non-evaluative, job-embedded, ongoing, is grounded in partnership, dialogical and is facilitated through communication that is respectful of the teacher's experience (Knight, 2009).

Literature supports that coaching is effective in supporting teachers translate knowledge to practice in working towards supporting her students in class. In an analytic study by Schachter et al. (2015) to identify trends in how researchers were designing and implementing PD, the authors had found that coaching was a common component in PD with teachers with half of the studies included in the analysis had a component with coaching. Coaching was used in the majority of the studies that had included the

teacher's skill, knowledge and disposition in their PD design and outcome measurement. To see sustained change in the teacher's practice, the author makes a case for the importance for PD programs to consider targeting the teacher's disposition as part of the PD program. Although coaching is a popular choice in PD design in addition to workshops, the authors cautioned that there is still limited evidence explaining the causal relationship between the coaching process and the teacher's change in instructional practice due to research design limitations (Schachter et al., 2015). The authors felt the variation of intensity of the coaching between studies had weakened the strength of the findings and therefore, cautioned about the overzealous inclusion of coaching as a component of PD. This viewpoint could be biased as the authors, in the context of the study, had only viewed coaching from a research design perspective. As much as research vigor is important, the lack of strength in explaining the causal effects between the coaching process and the change in the teacher's instructional practice does not equate that coaching as a strategy is less effective. This should strengthen the case for future research design to select a measure that will show the relationship between the coaching process to the teacher's implementation experience and practice.

In an earlier study, Kretlow & Bartholomew (2010) examined the effects of coaching on improvements in pre-service and in-service teachers' practice implementation. The studies included in this study showed that coaching was effective in improving the teacher's instructional fidelity, suggesting that coaching did catalyze a change in the teacher's behavior and instructional practice from initial training to the classroom setting. All of the studies studied had a short instructional component for the

teachers before the coaching. Although the number of studies that measured student outcomes was limited in the study, the authors are proponents of including coaching components in PD to "intentionally train teachers to use evidence-based practices in the classroom" (Kretlow & Bartholomew, 2010, p. 239). The authors also recognized that future research should examine the impact of coaching on the change in student performance through the use of reliable and valid measures. Aside to the limitations in research methodology, both studies by Kretlow & Bartholomew (2010) and Schachter et al. (2015) agreed that coaching had benefits in supporting teachers to make a change in their practice in comparison to traditional professional development in the form of stand-alone trainings and workshops.

Collaborative Consultation Model

Coaching and Collaborative Consultation in an education setting have a common goal to support teachers in improving the quality of education for their students, particularly students who have difficulties learning (Denton & Hasbrouck, 2009). A collaborative setting encourages successful adult learning as the person receiving the coaching is provided the opportunity to set their own learning goals that would like to focus on (Beavers, 2009). The collaborative consultation model is a triadic model where the consultee, i.e. the teacher, is the mediator of change between the consultant, and to the individual where change is sought, i.e. the student (Idol et al., 1995). It is an interactive process that enables individuals from different expertise "to generate creative solutions to mutually defined problems" (Idol et al., 1995, p. 329). The teacher is key in the relationship, as they directly influence the student through the implementation of the

agreed solutions. The consultant is the person with the subject expertise that would share knowledge with the consultee, to guide the consultee in generating targeted solutions to the mutually agreed problem. In the proposed program, the occupational therapist is the consultant providing the guidance to the teachers to apply evidence-based handwriting instruction practices and support children who may have difficulties learning handwriting skills.

In a collaborative consultation relationship, each partner value and respect each other as experts where the teacher is the expert. The teacher is the expert of their classroom, the curriculum and the difficulties of the students in her class. While the consultant brings knowledge of evidence supported interventions in the area that the student has difficulties in (DuPaul et al., 2011). The success of this approach comes when the teacher leads in identifying the problem and the consultant supports in providing evidence-informed solutions as options in the course of the discussions (Erchul, 2011). The benefit of the collaborative consultation model is that it encourages inter-disciplinary sharing for the positive outcomes of the student (Idol et al., 1995). There are four steps in the collaborative consultation prose which are (1) jointly defining the problem, (2) discussing possible evidence-informed solutions, (3) choosing a solution that is feasible and effective to implement by the teacher, and (4) evaluating the plan for any necessary modifications (DuPaul et al., 2011). As collaborative consultation is usually conducted on an individual level, the learning climate is supportive to teachers as adult learners.

Evidence of Adult Learning Theory in Professional Development

Weber-Mayrer et al. (2015) aimed to study the characteristics of early childhood educators participating in a state-sponsored Professional Development (PD). With the principles of andragogy as the underlying theory, the author aimed to study the characteristics of early childhood educators (ECE) as it may have implications on how PD programs are designed to support educator learning and change. The authors surveyed 263 ECE on their backgrounds and qualifications, work position in school, prior knowledge and beliefs in PD. The result of their study found several implications for the design of large-scale PD in terms of (a) format and learning design, (b) content and (c)marketing and recruitment. With regards to the format and learning design, the authors recommends that program design should accommodate to the different levels of teachers, i.e. training and experience, and explore a combination of alternative formats such as flexibility in time, coaching or online learning to support the teacher's learning as an adult who has roles beyond the classroom. Additionally, as ECE come with a variety level of knowledge, experience and beliefs, the authors propose that PD facilitators need to understand the level of content knowledge their participants come with so that the PD facilitator is able build on existing knowledge levels of the teachers. Understanding the knowledge levels of teachers can be achieved through pre-training surveys. In addition to understanding the baseline of knowledge, PD facilitators need to ensure that they provide evidence-based information that are relevant to the current issues faced by the ECE, ensuring that they link in practical application of the knowledge (Weber-Mayrer et al., 2015).

Previous Attempts to Address the Problem

Training alone may not ensure that there will be an application of training knowledge by teachers in changing their classroom practices. Dunst & Raab (2010) explored the effects of different types of Professional Development (PD) on early childhood educator's (ECE) perceived usefulness of training content and changes in their classroom practices, the authors found that in-service trainings that included components of on-site support in the participant's classrooms were perceived to be more beneficial than other types of training. Even though the limitations to the study included the use of self-report as an outcome measure and not considering factors that would affect learning such as readiness to change and learner's attitudes, the findings further adds to evidence and the importance of including processes and activities, such as opportunities for practice and feedback through coaching, supports meaningful changes in the teacher's teaching practices (Dunst & Raab, 2010).

Combining in-service training and individual coaching sessions post-training were found to be effective in promoting change in kindergarten teacher's instructional practice in their classroom in an earlier study by Kretlow et al., (2009). In the study, the teachers in the studies reported high levels of satisfaction using the strategies after the intervention. The intervention was to teach the teachers to use a Direct Instruction approach to teach mathematics. The authors had collected data of how the teacher's taught mathematics in class at baseline, post-in-service training and post-coaching. Their findings showed that there was some change in the teacher's practice, which is applying a Direct Instruction approach to teaching mathematics, but the teacher's minimally or

selectively applied the strategies post-in-service. After the coaching, the authors found another round of change in the teacher's instructional practice suggesting that coaching did build on the changes post-in-service training. The teachers were using more Direct Instruction approach in teaching mathematics after the coaching sessions. Although the authors did not report if the level of change post-coaching was higher than post-in-service, they did report that the teachers did reach a high level of improvement after they had received the coaching sessions.

Coaching and collaborative consultation is an increasing support area in school-based occupational therapy practice in recognition that for greater student outcome in the child's natural environment, i.e. the classroom, therapists can and should target the challenges in an 'up-stream' manner. There are increasing research that utilize collaborative consultation as an approach with intervention. In a pilot study by Hui et al. (2016), the authors aimed to study the impact of a training workshop about self-regulation with eight coaching sessions on teacher's self-efficacy and occupational performance. The teachers reported higher levels of self-efficacy to implement the strategies in their class as the coaching sessions helped the teacher focus on solutions. All teachers, regardless of years of experience, felt they had benefited from the intervention and had achieved the goals they had set for themselves. The author also reports that the gains were maintained at the follow-up after coaching.

Recommendations for Addressing the Problem

Judkins, Dague & Cope (2009) discussed the challenges and solutions to handwriting issues in schools, the author highlighted that the challenges such as a lack of teacher training in handwriting instruction and handwriting curriculum standards, may not be resolved with one intervention solution and proposed that the foundation for a successful solution is to work with the educational system. The author lists suggestions such as working with school administrations in refining handwriting curriculum, conducting handwriting clubs with a trained teacher, educating non-occupational therapy personnel on handwriting intervention concepts and theories through in-services.

In addition to the importance of continuing training, teachers equally value the transfer of learning into the classroom as well (Pineda-Herero et al., 2010). In this study, the authors found that despite teachers placing value on application of knowledge into their instructional practice, the teachers did not expand on the details on how the transfer of learning was implemented. The authors opined that, in reality, it could be possible that the teachers may not have proactively worked on applying the knowledge to change their instructional practice or perhaps the teachers may require continue support in this area post-training.

With literature evidence on the training needs of teachers in the topic of handwriting instruction (Donica, Larson & Zinn, 2012; Hart, Fitzpatrick & Cortesa, 2010; Schoenfeld, Coppola, Kertis & Barnes, 2009), the proposed program *Handwriting Success for School* aims to equip ECE in Singapore to be able to provide evidence-based handwriting instruction principles and to be able to support students whom they suspect

are having difficulties acquiring handwriting skills. In addition to providing training, teachers need to be supported in translating the knowledge into their teaching practice. Therefore, the proposed program includes post-training support in supporting teachers to transfer their knowledge to their handwriting instruction practice and in helping their weaker students develop handwriting skills. Figure 1 illustrates the application of Adult Learning Theory and Collaborative Consultation in the program's design to support improved student outcomes in handwriting skills.

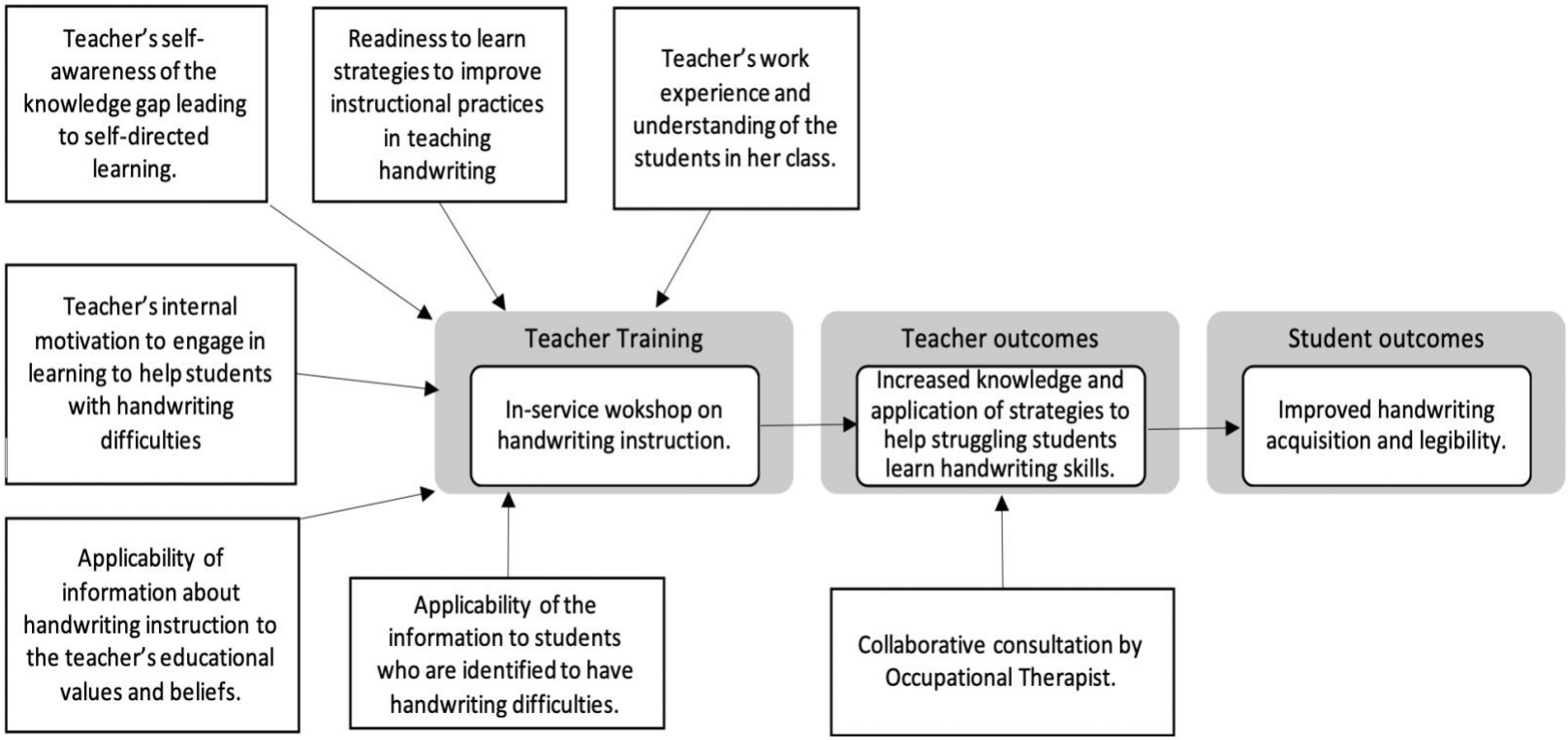

Figure 1. Application of the key principles of Adult Learning Theory and Collaborative Consultation model in the *Handwriting Success for School* program.

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CHAPTER THREE: DESCRIPTION OF THE PROPOSED PROGRAM

Program Description

In Singapore, children attend preschool till they are six years of age. Most children who attend preschool are exposed to pre-writing activities as early as three years old. By the end of kindergarten, children are expected to be able to write their name and the letters of the alphabet with appropriate speed before they enter into primary school (MOE, 2013). Unlike primary and secondary schools in Singapore that follow a centralized curriculum by the Ministry of Education, the preschool sectors has only a general curriculum framework that preschools use to guide the development of their curriculum (Lee & Quek, 2018). The framework does not detail when to begin handwriting instruction or how the teachers should plan for handwriting instruction as long as the objectives of teaching the children basic handwriting skills for entry into Primary One is met.

Due to the lack of common standards, there is variability in the handwriting instruction practices between preschool operators and centres and the quality of handwriting instruction would depend on the teacher's training and competence in teaching handwriting. Additionally, the lack of common standards in teaching handwriting between the preschools can lead to differences in student outcomes. Therefore, there is a need and opportunity for school-based occupational therapists in Singapore to provide training to early childhood educators (ECE) to facilitate improved quality handwriting instruction for Singapore preschool children. This is especially important for preschool children who may be struggling to acquire or master handwriting

skills. The *Handwriting Success for School* is a professional development program by occupational therapists that aims to increase the knowledge and capability of ECE to identify and support preschool students who are struggling to acquire or master handwriting skills and provide targeted intervention to these children.

Examples to Illustrate Key Concepts

The main objective of the program is to equip ECE in Singapore with the knowledge of handwriting skill development and effective handwriting instruction practices so that it increases the quality of handwriting instruction of the teacher, so that they are enabled to support students who may be struggling with developing handwriting skills. The program has two phases, a training and a support phase. The training phase consists of two in-service training session and the support phase consists of eight collaborative consultation sessions with an occupational therapist to support the ECE in translating their knowledge into the classroom for their students. The training phase aims at providing the knowledge base for the teachers to be able to select handwriting instruction goals to address and plan for a targeted intervention to meet the student's handwriting skills. Table 1 illustrates the two phases and the key activities of each phase of the program. Theoretical and conceptual frameworks from the fields of professional development for teachers, adult learning theory, collaborative consultation with teachers, together with current evidence about handwriting instruction were identified to shape and guide the content the program and its materials.

Training Phase	Support Phase

• Two in-service workshops
  - Teaching lecture
  - Group activities
  - Case study discussions
• Training materials & handwriting instruction manual.
	• Eight collaborative consultation sessions with occupational therapist
	• Classroom observations and feedback discussions.

Table 1 – Key activities in the training and support phase of the program.

Method of Delivery and Role of Personnel

The Training Phase

The first phase of the program is an in-service training for the ECE. It consists of two in-service workshops which are conducted weekly at the preschool center. Each participating ECE will receive training materials and a handwriting instruction resource manual. Adult Learning Theory principles and current evidence on effective handwriting instruction practices guided the development and design of the training materials (Admunson, 2006; Dinehart 2015; Fancher, Priestly-Hopkins, & Jeffries, 2018; Hart, Fitzpatrick, & Cortesa, 2010; Santangelo, & Graham, 2015). In view that on-site training is perceived by teachers to be more beneficial for their learning (Dunst & Raab, 2010), the in-service workshops will be conducted face to face by a school-based occupational therapist at the preschool center. The knowledge and skill set of occupational therapists in neuromuscular and sensory-motor background in addition to task analysis and modification makes occupational therapists a good candidate as facilitator of the training

and share their expertise with teachers in the area of handwriting development and handwriting instruction practice (Donica, 2010). School-based occupational therapists are ideal facilitators as they are familiar with teachers and their experience practicing in an educational setting will help in relating to the challenges within a classroom. Additionally, occupational therapists are key professionals in advocating for the development of the fundamental motor skills that preschool children require to prepare them for academic achievement and can help teachers increase their understanding of foundation skills needed for handwriting (Nye & Sood, 2018). The occupational therapist will present a power-point presentation slide developed by the author of the program for in-service workshop one and two. Table 2 illustrates the content that would be covered in both the training sessions.

In-service workshop	**Content**
1	• Development of fine-motor and handwriting skills of children from age zero to six years old. • Principles of effective handwriting instruction
2	• Identifying students who may be struggling to master handwriting skills by identifying support areas in the child's fine-motor and handwriting skills. • Activities and strategies to scaffold the learning of children who are identified to have difficulties.

Table 2 – Topic content of the training sessions.

In addition to the training slides, the training materials include a handwriting instruction resource manual, developed for the program, as a guide for intervention for the ECE. The handwriting instruction resource manual includes the following information:

- Fine-motor and handwriting skills development of children from age 0–6 years old
- Principles of effective handwriting instruction.
- Strategies to help children who have difficulties acquiring handwriting skills.
- Activity ideas with ready to use re-printable activity sheets.

The Support Phase

After the in-service workshops, the teachers will be assigned to an occupational therapist for the second phase of the program. During the Support phase, the teachers will receive eight weekly sessions of collaborative consultation sessions with an occupational therapist who are trained to provide the coaching. To encourage the commitment to the support phase, the teachers would pre-arrange the dates of the sessions in advance with the occupational therapist so that dedicated time can be set aside for the teacher to gain the best of the consultation experience. The benefit of the collaborative consultation model is that it encourages inter-disciplinary sharing for the positive outcomes of the student (Idol, Paolucci-Whitcomb & Nevin, 1995). Each of the consultation session would follow a general four-step process to encourage the teacher in refining her teaching practice in handwriting instruction. The four steps in collaborative consultation are: (1) jointly defining the problem, (2) discussing possible evidence-informed solutions, (3)

choosing a solution that is feasible and effective to implement by the teacher, and (4) evaluating the plan for any necessary modifications (DuPaul, 2017).

At the first session, the coach may conduct a class observation of the teacher teaching handwriting in her class as a way to collect information about the teacher's current teaching practice and her student's response to her instruction. After the observation, the occupational therapist would spend time building rapport with the teacher by inviting the teacher to share about her current work experience and discussing about the teacher's goals about improving her ability to teach handwriting skills to her class. Through the use of coaching strategies such as, active listening and positive nonverbal language (Idol, 1995), the occupational therapist would support the teacher in her planning of handwriting instruction strategies with the students whom the teacher has identified to require targeted support.

Each of the collaborative consultation sessions would begin with the coach inviting the teacher to share about her challenges teaching handwriting to her students or evaluating the effectiveness of the action steps or plan from the previous session in addressing the problem raised. Through the discussion, the occupational therapist would collaboratively explore the concerns and challenges raised by the teacher. The occupational therapist may, in the course of the discussion, share expert opinion about the possible fine-motor or visual-motor issues that could be contributing to the student's difficulties. Once the problem is jointly defined through the process of goal-setting (Idol, 1995), the discussion would move towards generating possible evidence-based strategies that would address the problem. From the list of strategies, the teacher would then select

a strategy that she feels would be feasible and effective to implement in her classroom or teaching practice. The actions steps or plans discussed would be implemented in the duration before the next session and its effectiveness would be discussed in the next consultation session, where the four-step collaborative consultation process would be repeated. The pair would also document their discussion and the action steps briefly in the coaching log after each consultation session.

Method to Recruit Participants

The program is open to all teachers in the early childhood field including Learning Support Educators in the Development Support and Learning Support (DSLS) program in Singapore. The Development Support and Learning Support program (DSLS) is a national early detection and intervention program that aims to build capability and capacity within the early childhood landscape to support children with mild developmental needs (Tan, Chong, Oh & Tang, 2016). The program adopts a tiered model to intervention where preschool teachers are trained to identify children with developmental needs. The Learning Support Educators (LSEds) are ECE who have undergone rigorous training to identify, screen and provide intervention support to the children who have mild developmental delays (Tan et al., 2016). To encourage sign up from teachers, the program will be advertised through the Early Childhood Agency (ECDA) for center leaders and principals to share with their teachers in the preschools. As for recruitment of the LSEds, an announcement at the LSEd Professional Learning Circle and also emails to the team leaders will be made to encourage LSEds to participate.

Literature Review for Program

Literature suggests that there are benefits in addressing fine-motor skills at the preschool level. A search of the literature shows that kindergarteners with better fine-motor skills, particularly design copy performance, achieve better academically (Cameron et al., 2012). Teaching handwriting explicitly improves handwriting legibility and fluency (Satangelo & Graham, 2016) and word reading skills (Berninger et al., 2006). Direct instruction in letter formation is especially important for children who are at-risk of challenges in writing and reading (Berninger et al., 2006). However, a student's handwriting fluency and legibility is predicted by teacher competence in providing handwriting instruction and attitudes toward teaching handwriting and instructional time (Graham et al., 2008).

Although teachers perceive that training for handwriting instruction is important (Donica et al., 2012), teachers feel they do not have sufficient training in providing handwriting instruction, identifying fine-motor delay in children to help the children in their class who are struggling to learn to write (Whermann, et al., 2006; Graham et al., 2008; Donica et al., 2012). This lack of instructional knowledge could weaken the quality of teacher's handwriting instruction (Graham et al., 2008).

High quality professional development for ECE targets teacher-identified gaps in knowledge and skills and includes "teaching practices that support developmental goals for children" (Schachter et al., 2019, p. 397). Therefore, the breadth of the program's training materials not only cover what is expected developmentally when a child learns handwriting skills but also includes evidence-based handwriting instruction practices that

has shown to be effective.

One-off trainings have shown limited success in supporting teachers translate knowledge gained into changing teaching practice (Dunst & Raab, 2010; Schachter et al., 2019). Teachers find the additional post-training support via coaching effective in encouraging and motivating them to incorporate the strategies into their teaching practice (Lieber et. al, 2010). Training designs with coaching is an effective element of in-service programs in improving classroom practice as it offers a higher intensity of training even if the duration was short (Egert et al., 2018). When teachers collaborate with occupational therapists in addressing handwriting acquisition and intervention for their preschool students, teachers feel supported to help struggling students (Fancher et al., 2018).

Incorporation of Theory into the Proposed Program

A thorough review of the evidence literature identified *Adult Learning Theory* (Knowles, 1977) as an appropriate and meaningful framework to guide professional development in teachers. The program incorporates principles of *Adult Learning Theory* (Knowles, 1977) and evidenced based characteristics of effective professional development to structure the training content (Dunst & Raab, 2010). As adult learners draw upon their experience as a rich resource for learning (Merriam & Bierema, 2014), the face-to-face in-service training of the program will provide an opportunity for the facilitator of the workshop to engage the learners through discussions. Effective professional development (PD) training for teachers includes opportunities for learners to engage in exercises, role plays or real-life opportunities to learn and master practices, demonstrations of practices, opportunities for learners to receive feedback and coaching,

repeated interactions between facilitator and learner to strengthen the learner's abilities and promote acquisition of new competencies (Dunst & Raab, 2010). The training component in the program includes group activities where the learners would have the opportunity to practice suggested handwriting instruction methods or practice selecting intervention strategies based on case studies. As adult learners are problem-centered in their learning and desire immediate application of the knowledge learnt (Merriam & Bierema, 2014), case study discussions are incorporated into the training to provide an opportunity for the ECE to practice identifying areas for intervention and in lesson planning and an opportunity to receive feedback.

However, training alone will not ensure a change in instructional practice as they are considered "low-dosage models that do not provide opportunities to engage in the critical processes that promote teacher development" (Schachter et al., 2019, p. 396). Studies have shown that providing coaching to the teachers in addition to training has been effective in supporting a change in their instructional practice (Dunst & Raab, 2010; Kretlow & Bartholomew, 2010; Schachter, 2015; Schachter et al., 2019). In view that the focus of the program is to provide PD to ECE in the area of handwriting instruction, *'Handwriting success for school'* combines training and coaching through *Consultative Collaboration* model (Idol et al., 1995) to promote effective changes in the way ECE provide handwriting instruction and support preschool children to acquire basic handwriting skills.

Potential Barriers and Challenges to Implementation

As teachers are often busy individuals, one potential barrier to the program would be to encourage early childhood educators to participate in the program. Even with wide marketing of the program, teachers may feel that they do not have the time to commit to the program duration. Preschool principals or administrators do need to ensure that early childhood educators have the access to PD opportunities as a means of life-long learning (Weber-Mayrer et al., 2015) hence, collaborating with school administrators and principals would be key in addressing this barrier to message strong support that teachers can avail themselves for PD. Therefore, having the program acknowledged as a recognized PD training course that, contributes to the expected training hours by ECE to fulfill, by the National Institute of Early Childhood Development (NIEC), a major training provider for the early childhood sector in Singapore (NIEC, 2020), would be influential in encouraging sign-up and commitment to the program.

Expected Outcomes

The proposed program entitled, *Handwriting Success for School*, is a professional development program by occupational therapist that targets ECE in Singapore. The main objective of the program is to equip ECE in Singapore with the knowledge of handwriting skill development and effective handwriting instruction practices so that it increases the quality of the teacher's handwriting instruction. The program aims to increase the competency of the ECE to identify and support preschool students who are struggling to acquire or master handwriting skills and provide targeted intervention to these children. The program utilizes in-service training and collaborative consultation as

a driver to meet the expected outcomes.

In view that knowledge and competency in handwriting instruction is the intended outcome of the program, it is important to evaluate if the program was designed to meet the stated outcomes. By evaluating the program, the program designer, program participants and funders will know if the training and support components of the program was effective in increasing the teacher's competency in handwriting instruction and supporting their students who were identified to be struggling with acquiring handwriting skills. Prior to the training, the teachers are requested to fill in a survey on their perceived level of knowledge and competency in handwriting instruction and in supporting students struggling to acquire handwriting. After the completion of the support phase, the teachers would complete the survey again. Details of the evaluative methods are discussed in detail in Chapter Four.

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CHAPTER FOUR: EVALUATION PLAN

Program Outcomes and Vision for Evaluation

Early childhood is a time to build foundational skills in the various performance domains such as motor skills, language, self-care and academic skills. Preschool students in Singapore are taught the basics of handwriting in preparation for primary school where they are expected to be able to write their name and the letters of the alphabet with appropriate speed (MOE, 2013). However, there is a gap in common standards and handwriting instruction practices among early childhood educators (ECE) in Singapore. The proposed professional development program by occupational therapists entitled *Handwriting Success for School* is targeted at ECE which includes preschool teachers in the various preschool centers and Learning Support Educators (LSEds). LSEds are early childhood educators who have undergone rigorous training to identify, screen and provide intervention support to the children who have mild developmental delays (Tan et al., 2016). The program aims to increase the competency of ECE in Singapore to provide high quality core instruction in teaching handwriting and, to identify and support preschool students who are struggling to acquire or master handwriting skills. With an increased knowledge and competency, these teachers are enabled to provide targeted support to students who have difficulties at the primary prevention level of the Response to Intervention framework (National Center on Response to Intervention, 2010).

The program has two phases which are training and support. The program begins with the training phase where the ECEs will attend two in-service workshops facilitated by an occupational therapist. A handwriting instruction resource manual, consisting of

information about teaching handwriting, activity ideas and pull-out worksheets, is given to the participants as a teaching resource. The training phase aims at providing the knowledge base for the teachers. The expected outcome of the training would be to increase participant's knowledge of fine-motor development of children aged zero to six years old, handwriting instruction practices based on evidence, and strategies to support struggling students.

The support phase begins after the training where the participants will receive eight collaborative consultation sessions with a school-based occupational therapist who is trained in the approach for the program. The aim of the support phase is to support the teachers to translate their learning into their classroom practice through a collaborative consultative approach. The expected outcome of this phase is that participants, in the process of the collaborative consultation sessions, would experience an increased level of competence and confidence in teaching handwriting to their class and supporting students who may have difficulties learning handwriting skills. As a result of increased teacher confidence and competence, the expected long-term outcome of the program is for students to receive early support by their teachers in the classroom. With the provision of early intervention by the classroom teachers, the number of children, who would usually be referred to Occupational Therapy services to address their handwriting delays, would reduce over time. The simplified logic model in Figure 2 below highlights the key activities of the program and the outcomes expected from the program.

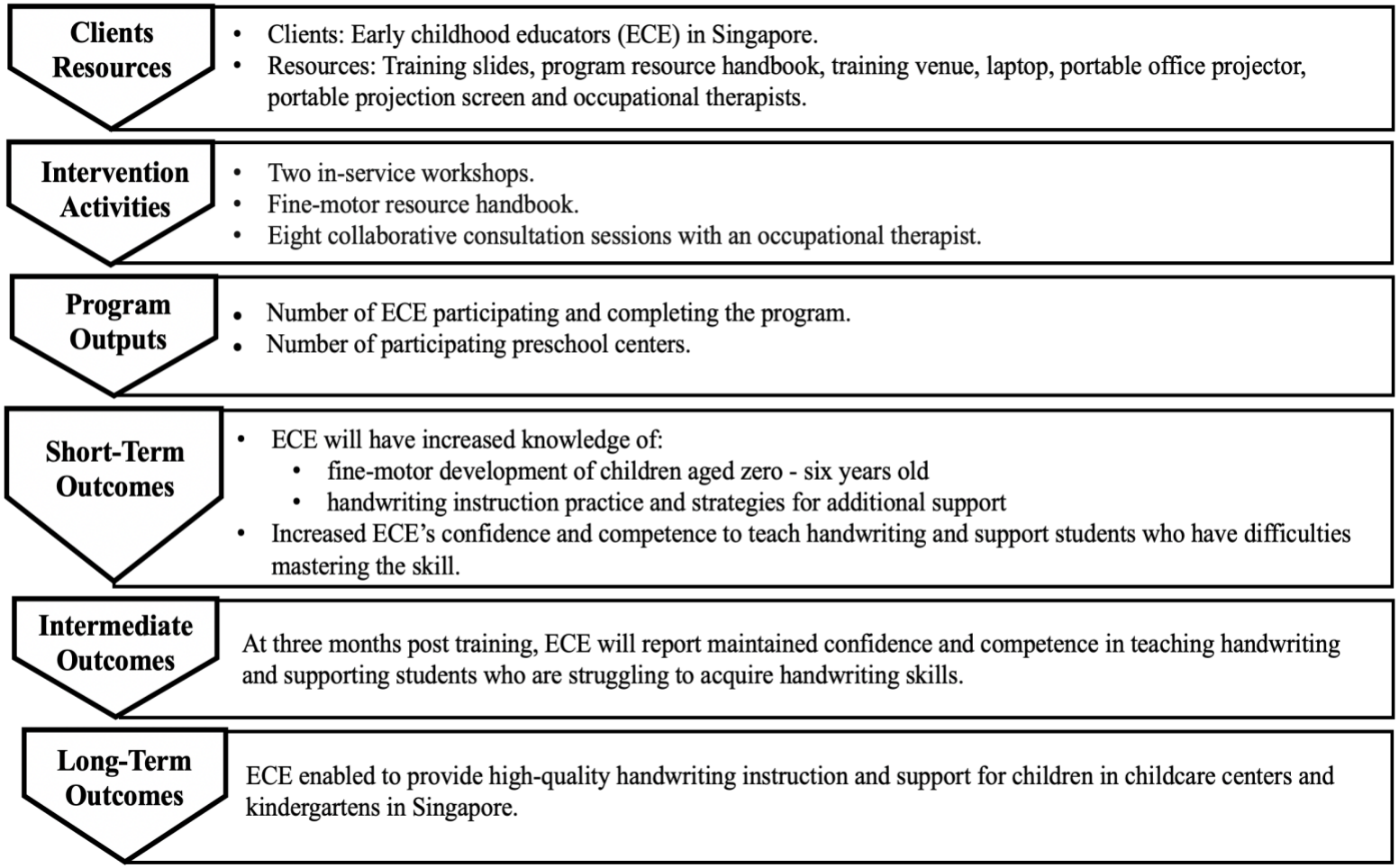

Figure 2 – Simplified logic model of the *Handwriting Success for School* program.

Preliminary Exploration and Confirmatory Process

To begin to understand the perceived level of knowledge and competence of the ECE in their ability to teach handwriting and support children who are struggling to acquire the skill, a preliminary survey using Google Forms will be sent out to selected ECE in Singapore. Survey respondents would include preschool teachers and LSEds so that both groups are represented in the results. The survey would include questions such as if they are working as a preschool teacher or LSEd, years of working experience as an ECE, perception of their training to teach handwriting, perception of their level of knowledge about fine-motor development in children aged zero to six years old, perception of their ability and confidence in supporting children who have difficulties acquiring handwriting skills. No personal details will be collected at this preliminary stage, keeping the survey information anonymous.

Data Collection

As the proposed program is a professional development program targeted at ECE, information about the program will be disseminated to preschool centers in Singapore. A web-link and QR generated code to a to an online registration form via Google Form will be included in the information sheet about the program. ECEs interested in the program will be able to register for the program. Registration will open from the time the information is shared to the preschools and kept open until one month before the start of the program or until the maximum capacity is met. Participant consent for the program evaluation will be asked upon registration. All personal information such as names and contact number or email will be collected in the form. Once registration is closed, the

form is downloaded and kept secure in a password protected data storage device.

The training will be conducted at a training site with a notebook and projector. The handwriting instruction resource manual that accompanies the training slides will be disseminated to the ECEs on the training day. The ECEs will be asked to fill in a pre- and post- training survey on the training day to gather data about their perceived level of knowledge of fine-motor development in children aged zero to six years old and their perceived confidence in teaching handwriting and helping students who have difficulties learning handwriting skills. Additionally, participants will also rate the usefulness of the training materials and the learning experience. After the in-service training, the participants would be assigned to a school-based occupational therapist trained to provide collaborative consultation for the program. At the end of the support phase, participants will complete a survey to measure their perceived level of confidence and competence in teaching handwriting and helping children who have difficulties learning handwriting in their class. A three-month follow up survey would be sent to all the participants in the program to find out if the changes in perceived confidence and competence is maintained after the program.

Program Evaluation Design

The vision for the program evaluation is to see an increase in the ECE's knowledge, competence and confidence in teaching handwriting skills and supporting children who have difficulties acquiring the skill. By gathering and evaluating participant's perceived level of knowledge and competence before and after the program, the results will highlight if the program was effective in increasing the teacher's

competency in teaching handwriting and supporting students who are having difficulties learning handwriting skills. This would be an important outcome to support the need of continued professional education for teachers in this area. In addition, the program would also highlight the benefits of collaboration between school-based occupational therapists and teachers in supporting the quality of instructional practice in preschools. If teachers are competent in teaching handwriting and supporting children who have difficulties, then preschool children will be able to receive early support to be successful in developing the handwriting skills needed to transit confidently into Primary School in Singapore.

As the active ingredients of the program are the training and collaborative consultation sessions, the program evaluation aims to highlight the effectiveness of the activities of the program in achieving the outcomes of increasing the ECE's knowledge, competence and confidence in teaching handwriting and supporting children who are struggling to acquire handwriting skills. The program would utilize pre- and post-intervention surveys to gather participant feedback at the beginning and end of each phase of the program.

At the training phase, the expected outcome is increased participant's knowledge. The pre-training survey will consist of Likert scales designed to seek if the delivery of the training by the facilitator, information presented, training activities and handwriting instruction resource manual were useful in increasing their knowledge about fine-motor development of children aged zero to six years old, handwriting instruction practices, and strategies to support struggling students. A 5-point Likert scale was chosen as it allows

some variance in the responses in comparison to a bipolar scale. Figure 3 illustrates the Likert scale questions in the pre-training survey form.

At the post-training survey, the questions will be a mix of the same Likert-scale questions in the pre-survey and three open-ended questions. Open-ended questions will yield some qualitative information from the respondents that will reflect their perspective on the portions of the training material or handwriting instruction resource manual that was most meaningful to their learning. Figure 4 illustrates the open-ended questions in the survey.

Handwriting Success for School pre-training survey

For each of the statements below, please rate the response that best characterizes how you feel about the statement.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. I am familiar with the fine-motor development milestones of children aged zero to six years old.	☐	☐	☐	☐	☐
2. I am familiar with what research evidence says is effective to teach handwriting skills to my students.	☐	☐	☐	☐	☐
3. I know how to use effective handwriting instruction practices when teaching my student's handwriting.	☐	☐	☐	☐	☐
4. I am confident in teaching handwriting to my students	☐	☐	☐	☐	☐
5. I can help all my students learn handwriting.	☐	☐	☐	☐	☐
6. I know how to tell when my student is struggling to learn handwriting skills.	☐	☐	☐	☐	☐
7. I know how to identify fine-motor delay in my students.	☐	☐	☐	☐	☐
8. I know how to help my students who are struggling to learn handwriting skills.	☐	☐	☐	☐	☐
9. I am confident in helping students who are struggling to acquire handwriting skills improve.	☐	☐	☐	☐	☐

Figure 3 – Example of the Likert-scale items in the pre-training survey.

10. What did you like most about the in-service workshop?

11. What did you wish could have been covered better in the in-service workshop?

12. What did you like about the handwriting instruction resource manual?

Figure 4 – Example of open-ended items in the post-training survey.

The survey would be in an online format for ease of access and consolidation of the responses. A QR code will be generated for the link to the online survey form, making it convenient for the participants to access and fill up the form. The post-training survey will be a separate online form with a different QR code so that the responses can be kept separate. The same questions will be used in the post-training survey so that a comparison can be done. The number of surveys completed on the day of training will be compared with the attendance list to determine the rate of response. An advantage of an online survey is that response rate can be determined very quickly in real time, giving an opportunity for the instructor to encourage all the participants to fill the survey before the training session. Personal particulars will be collected during the survey to provide a comparison in the and the survey data will be stored securely in the program's Google Drive account.

The expected outcome of the support component is that, as a result of the eight collaborative consultation sessions, the participants would experience an increased level of competence and confidence in teaching handwriting to their class and supporting students who may have difficulties learning handwriting skills. Similarly, a survey would also be utilized to measure the effectiveness of the collaborative consultation sessions on the ECE's sense of competence and confidence in applying the training information to their classroom practice. After the eight collaborative consultation sessions, the participants would be asked to fill a post-support phase survey. The training survey questions would be utilized with additional items included to measure their perception of the impact of the collaborative consultation sessions on their level of competence and

confidence. Figure 5 illustrates the additional items that would be added into the post-support phase survey. Changes in the ratings on the Likert scale, at post-test comparison, would indicate improvements in the LSEd's perceived confidence and competence level before and after the training and support phase. The post-survey will be done right after the eight consultation sessions and at three months post-program to monitor if the changes were maintained.

Handwriting Success for School post-support survey

For each of the statements below, please rate the response that best characterizes how you feel about the statement.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. I found the collaborative consultation sessions with the occupational therapist useful in improving the way I teach handwriting to my class.	☐	☐	☐	☐	☐
2. I know how to use effective handwriting instruction practices when teaching my student's handwriting.	☐	☐	☐	☐	☐
3. The collaborative consultation sessions helped me identify students who have difficulties learning handwriting or fine-motor delay.	☐	☐	☐	☐	☐
4. I know how to tell when my student is struggling to learn handwriting skills.	☐	☐	☐	☐	☐
5. I know how to identify fine-motor delay in my students.	☐	☐	☐	☐	☐
6. I found the collaborative consultation sessions helpful in developing a plan to support my student who has difficulties.	☐	☐	☐	☐	☐
7. I know how to help my students who are struggling to learn handwriting skills.	☐	☐	☐	☐	☐

Figure 5 – Example of post-support phase survey items.

Data analysis

In view that the perceptions of the ECEs will be collected and the same questions will be used pre- and post- training, a Wilcoxon Sign-Rank test would be utilized to compare the difference in the responses in each question. The data collected via a password-protected account on Google forms will be downloaded as an Excel sheet. The statistical analysis would be conduct with the Microsoft Excel program. The responses in the open-ended questions can be consolidated and themes can be drawn from the responses to provide insight and details into any correlations found in the pre- and post-data. The data will then be stored in an encrypted data storage disk after it has been downloaded. The responses on the Google Form platform will be deleted after the data has been collected.

Dissemination of the Findings

The *Handwriting Success for School* program is a unique program as it aims to enhance the knowledge and competency of ECE in Singapore to teach handwriting and supporting children who have difficulties learning the skill. The value in targeting ECE is because teachers are the main personnel supporting children in school and are best positioned to provide support at the primary level of prevention (National Center on Response to Intervention, 2010). As a result of the program, the ECE's quality of instruction in teaching handwriting skills would be increased which is core at the primary level of prevention. Additionally, the teachers would also be better equipped to provide early support and by doing so, it serves as a cost-effective strategy in addressing any developmental concerns as it arises in the classroom. The findings of the evaluation can

be presented at the annual Singapore Early Childhood Conference, reaching more stakeholders to consider the program as part of their teacher's professional development needs. Additionally, the results could also be presented at Singapore's annual National Occupational Therapy Conference to highlight the potential avenues of service and influence Occupational Therapists can make in the pre-school setting. By presenting at the National Occupational Therapy Conference, it highlights the unique contribution of a school-based therapist in the early childhood sector and perhaps inspire others to join the preschool sector.

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CHAPTER FIVE: FUNDING PLAN

Project Description

In Singapore, when children enter primary education and before kindergarten, they are expected to be able to write their name and the letters of the alphabet with appropriate speed (MOE, 2013). Although the expectation is clear, there lacks a common standard in teaching handwriting at preschools resulting in a disparity in the children's handwriting skills as they graduate from kindergarten. Additionally, those children who are struggling to learn handwriting may not receive the early support they need as they are learning the skill. *Handwriting Success for School* is a professional development program targeted at Early Childhood Educators (ECE) by occupational therapists. The program aims to increase the competency of ECE in Singapore to provide high quality core instruction in teaching handwriting and, to identify and support preschool students who are struggling to acquire or master handwriting skills. With an increased knowledge and competency, these teachers are enabled to provide targeted support to students who have difficulties at the primary prevention level. Providing early support to children who show difficulties in learning handwriting skills can decreased the risk of these students experiencing academic delays particularly in literacy skills (Cameron et al., 2012; Suggate et al., 2019). In view that the program targets teacher's knowledge and competency in teaching handwriting and supporting weak students, the program promotes high-quality instruction of teachers in the classroom in the area of handwriting skill.

Funding Plan Introduction

Program development and implementation requires resources that includes time, materials, personnel and financial resource. This chapter aims to detail the funding plan for the successful development and implementation of *Handwriting Success for School* program. There will be expenses associated with the planning, implementation and dissemination of the proposed professional development program for ECE in Singapore.

Expenses for the planning of the program

In the first half of Year One, time and resources will be focused on the preparation of the materials for the training and support phase of the program which include the training slides, handwriting instruction resource manual and the coaching log. Most of the preparation for the training will be done at personal cost initially, using personal equipment such as a notebook computer with the relevant Microsoft programs, to prepare and design the program materials. Apart from the training materials, the pre- and post-training surveys and the pre- and post-support session surveys would also need to be developed. Google Forms would be the choice of survey tool to develop the surveys as it is available free online, and the data can be extracted for data analysis in Microsoft Excel format at the evaluation stage of the program implementation.

Expenses for Program Implementation

The implementation of the program would run in the second half of the first year when all the training materials are ready. When the program is ready to be implemented, the cost for conducting the training and coaching sessions would need to be considered and budgeted. The expenses for implementation include fees for the trainer and coaches,

printing of the training and coaching materials, and expenses related to the training sessions. The duration of one run of the program would take about three-four months to complete therefore, in Year One, the program would be able to run once. In the Year Two, the program can be implemented at least twice a year. The program aims to target at least two teachers in one pre-school center in the first year and two more pre-school centers in the second year of implementation.

School-based occupational therapists would be the choice of trainer and coaches in view of the knowledge and skill set they possess in the area of handwriting development and intervention. The fees for the Occupational Therapist would be budgeted by the hour based on the FY2020 Salary Guideline for the Social Service Sector in Singapore (NCSS, 2020). Based on the salary guideline, the suggested salary for competent occupational therapist who has relevant experience is SGD $5290. Based on a 40-hour work week, the fee by hour would be at SGD $33. The training sessions consists of two in-service workshops, which are about three-hours in duration, so the total amount to run the training sessions would amount to SGD $198. The coaching sessions consist of eight sessions per teacher, which are about two-hours in duration per session. The cost for an Occupational Therapist to conduct the collaborative consultation sessions per teacher would be SGD $528. The program aims to train at least two teachers per run at the preschool center bringing the total cost for the coaching sessions to SGD $1056.

The program would be conducted at the local preschool center as it would be convenient for the teachers to be able to attend the two in-service training sessions at their pre-school center. Most preschool centers have a multi-purpose room that can be

used for teaching sessions. Equipment such as a notebook computer, portable projector, portable projector stand will be purchased so that the occupational therapist is able to conduct the training session at the preschool. Having portable equipment is important as it allows the ability for the program to be held in different venues and the running of the training sessions would not be limited to room availability and rent for the venues. In addition to the equipment, the teachers would receive training materials which includes printed copies of the slides and a handwriting instruction resource manual. Details of the training materials are detailed in Chapter Three. During the coaching sessions, copies of a coaching log would be used in the sessions to document the goals and plans of the teacher. It is estimated that the printed training materials would amount to 100 pages per teacher therefore the printing cost would amount to SGD $150 per run of the program. Table 3 summarizes the program budget for Year One and Year Two of the program.

<table>
<tr><th>Budget Items</th><th colspan="2">Year One</th><th colspan="2">Year Two</th></tr>
<tr><td rowspan="2">Salary
Fee for the Occupational Therapist service - SGD $33 per hour.
Training session duration: 2 x 3-hour sessions.
Coaching session duration: 8 x 2-hour sessions per teacher.</td><td>Development of program materials</td><td>SGD$5280</td><td rowspan="2">Program implementation</td><td rowspan="2">SGD$2508</td></tr>
<tr><td>Program implementation</td><td>SGD$1254</td></tr>
<tr><td rowspan="4">Equipment</td><td>Notebook</td><td>SGD$1500</td><td colspan="2" rowspan="4">Nil</td></tr>
<tr><td>Microsoft Office software</td><td>SGD$379</td></tr>
<tr><td>Portable office projector</td><td>SGD$500</td></tr>
<tr><td>Portable projector tripod screen</td><td>SGD$200</td></tr>
<tr><td>Printing of program materials
SGD $0.50 per sheet of paper
Projected 100 pages of training materials per teacher</td><td>Pilot implementation</td><td>SGD$150</td><td>Cost for 2 runs</td><td>SGD$300</td></tr>
<tr><td>Total:</td><td colspan="2">SGD$9263</td><td colspan="2">SGD$2808</td></tr>
<tr><td>Dissemination cost:</td><td colspan="4">SGD$3978.60</td></tr>
<tr><td>Total expenses:</td><td colspan="4">SGD$16,049.60</td></tr>
</table>

Table 3 – Program budget

Funding Resources

The funding of the program would have contributions from in-kind resources and grants to support its the successful implementation. An example of an in-kind contribution would be to cover the cost of the printed materials. Instead of sending the training materials to a printer, the management of the department where the author works could provide approval to use the office supplies to print the training materials for the program.

Other potential funding sources could be applied to fund the program. School-based occupational therapists working in the Development Support Learning Support Program are employed by Social Service sector in Singapore (Tan et al., 2016). In partnership with an occupational therapist in the Development Support Learning Support Program, this professional development program for teachers can be funded through the Voluntary Welfare Organization-Charities Capability Fund Professional Capability Grant. Alternatively, as the program is targeted at professional development of pre-school teachers, a teacher-initiated approach to conduct a practice inquiry in the area of teaching handwriting may be an option to funding the program through the Early Childhood Development Agency (ECDA) Practitioner Inquiry Grant. Table 4 summarizes these potential funding sources.

Funding Sources	Description
Early Childhood Development Agency (ECDA) Practitioner Inquiry (PI) Grant	The PI Grant is a grant by the ECDA that supports professional development initiatives to conduct an inquiry in the classroom for the aim of improving teaching-learning practices. Main applicant or team members should have attended ECDA-organized Practitioner Inquiry workshops. Participants co-pay 10% of the cost of the project with a maximum of SGD$4000 grant is awarded to center-wide PI project.
Voluntary Welfare Organization-Charities Capability Fund Professional Capability Grant (PCG)	PCG is a grant by the National Council of Social Services (NCSS) that aims to raise the professionalism and improve services in the social service sector. The Open category of the grant supports initiatives and projects the targets to increase the capability of the social service sector. It is open to projects that provides professional skills-based training that addresses existing gaps in the training landscape. Up to 80% of the approved project cost is funded with funding level capped at SGD$100,000 Open to members of NCSS Voluntary Welfare Organization or programs funded by the Ministry of Social and Family Development. Eligible applicants are encouraged to apply for discussion and advice on available support.

Table 4 – Funding sources

Conclusion

In summary, the *Handwriting Success for School* program will incur expenses during the planning and implementation of the program. As most of the cost during the planning stage is mostly covered by personal cost, the cost to start the implementation of the program in the first year, amounting to SGD $3983, due to cost to purchase equipment to provide the training. With the initial start-up cost, the program, in a stable

state, would be able to run twice a year on a budget of only SGD $2808 a year (see Table 3). Potential funding sources to cover the anticipated expenses may include grants by the National Council of Social Services or by the Early Childhood Development Agency in Singapore.

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CHAPTER SIX: DISSEMINATION PLAN

Description of the proposed program

Handwriting Success for School is a professional development program by occupational therapists targeted at early childhood educators (ECE). The program aims to increase the competency of ECE in Singapore to provide high quality core instruction in teaching handwriting. In addition, the program would enable teachers to be able to identify and support preschool students who are struggling to acquire or master handwriting skills. Tier One within the Response to Intervention model emphasizes on teachers being the main personnel in supporting children's participation in the classroom (Bayat, Mindes, & Covitt, 2010). The program offers professional development (PD) opportunities for ECE in Singapore, enabling them to provide Tier One support to children identified to be at risk of developmental difficulties.

The program has two phases: training and support phases. In the training phase, participating ECE would attend two in-service workshops that aim to increase their knowledge and understanding of fine-motor development in preschoolers and evidence-based principles of teaching handwriting. In addition, the ECE would learn to develop handwriting instruction goals, plan for a targeted solution, and learn to monitor for progress in supporting their student's handwriting skills. After the training phase, the participating early childhood educators would move into the support phase where they will receive eight collaborative consultation sessions with an occupational therapist. With the use of a Collaborative Consultation model, the occupational therapist would support them to translate their knowledge gained at training into their daily class instruction. By

adopting a collaborative approach, it encourages participating ECE to apply their knowledge and skills which would result in their increased teacher self-efficacy and positive outcomes in the children.

Dissemination Goals

High quality instruction by the class teacher benefits pre-school children and leads to better developmental outcomes. Within the Response to Intervention model, enabling teachers to provide universal core instruction can prevent further developmental delays in the children and provide early intervention to children who are identified to be at-risk (Bayat, Mindes & Covitt, 2010). The proposed program provides an opportunity for ECE to engage in professional development to continually improve their instructional practice. Intentional dissemination of the program would support ECE in Singapore to be able to provide high quality teaching and early intervention for students who may require extra help in developing the functional skills they need for learning and class participation.

In the short-term, the implementation of the program would provide professional development opportunities for early childhood educators. Occupational therapists, with their knowledge in neuromuscular and sensory-motor development, are the best suited and qualified personnel in equipping teachers to provide high quality handwriting instruction and in supporting children who may have difficulties (Donica, 2010; Donica et al., 2012). As the program opens opportunities for occupational therapists to contribute to teacher training, it would increase opportunities for collaboration between ECE and occupational therapists.

A milestone in the dissemination of the program would be when the program is listed in the prospectus of PD programs for ECE in Singapore. When the course is listed, awareness and access to the program would be increased for the ECE. As more ECE complete from the *Handwriting Success for School* program, the teaching practice and quality of the ECE when they teach handwriting would improve. This would contribute to the long-term goal of the program where pre-school children, identified to have difficulties, would be able to receive timely early intervention in pre-school by their own class teachers. With closer collaboration in the preschool education setting, school-based occupational therapists would have increased opportunities to contribute to teacher training at the pre- and in-service levels. Table 5 summarizes the short-term and long-term goals of the dissemination plan.

Short-term goals	Long-term goals
1. To be able to provide a professional development program for early childhood educators to provide high quality instruction for teaching handwriting skills to their students. 2. To encourage collaboration between ECE and occupational therapists in the preschools. 3. To work towards listing the program as a key professional development course at the local teacher training institute.	1. Early childhood educators will be able to provide timely early intervention in the class to children who are identified to be at-risk of developmental delay. 2. Occupational therapists' contributions to the training of early childhood educators will be valued at the pre-service and in-service levels.

Table 5 – Short-term and long-term dissemination goals of the program.

Key Messages and Dissemination Activities for the Primary Audience

Early childhood educators (ECE) in Singapore would be the primary audience as they are the main stakeholders of the program. ECE include both preschool teachers and Learning Support Educators (LSEds) in Singapore. Upon completion of the program, selected participants would be asked for consent to be approached to share their feedback about how the program had benefited them. These participants would share their experience in a brief interview after the program. Their experience would be documented in a written format for publication or in a form of a short promotional video. These testimonials of participants who had completed the program would be influential in encouraging prospective early childhood educators to consider enrolling for the *Handwriting Success for School* program. The following are the key messages for the primary audience:

- Providing high quality teaching instruction when teaching handwriting skills facilitates children in developing strong handwriting skills which supports their academic skills.
- The importance of providing support and early intervention to children identified to have difficulties mastering handwriting skills will decrease the risk of academic delays.
- The *Handwriting Success for School* professional development program by occupational therapists that equips ECE with the knowledge and skills to be able to provide high quality instruction to teach handwriting confidently. The program would also enable them to be able to identify and provide early intervention to

children who may need more assistance in mastering handwriting skills in their class.

Dissemination activities for the primary audience:

The following are the dissemination activities in promoting the program to ECE in Singapore:

- Written information
    - Promotional flyers about the program so that preschools can place them on the notice boards for teachers to note. The flyer would cost SGD $500 for 1000 pcs for double side color printing.
    - Promotional flyers about the program will be printed to give to potential participants at conferences. The flyer would cost SGD $330 for 1000 pcs for double side color printing.
    - Printed promotional banner pens with the program's name and objectives will be printed and distributed at conferences. The cost to print 1000 pens is SGD $430 (Giftmarket, 2020).
    - Article contribution to the Beanstalk magazine about the importance of developing a child's foundation in fine-motor skills for learning handwriting skills. Beanstalk magazine is a quarterly magazine targeted at ECE and parents by the Early Childhood Development Agency (ECDA). The article will also feature the program through a program participant's experience of the benefits of supporting her student's learning of handwriting skills when she had provided support of the child's fundamental fine-motor skills.

    - Article contribution to the Early Educators Journal, a bi-annual publication by the Association for Early Childhood Educators Singapore's (AECES) on the importance of good handwriting instruction practices in supporting handwriting skill development in preschoolers.

- Electronic media
    - Create a web page for the program to create an online presence for interested stakeholders to learn more about the program and the benefits to early childhood educator professional development. Details about upcoming trainings or how to invite the program in their preschool will be available on the website. A basic package with a web domain name and ongoing website maintenance support would cost SGD $20 per month (Plans & Pricing, 2020)
    - Create a Facebook and LinkedIn page where information about the program can be found. The page will also be updated on a weekly basis to provide useful resources about teaching handwriting to encourage teachers to visit the page. Interested individuals who would like to participate in the program will be directed to the program's main website for more information. Setting up a page on the stated social media platform does not require cost.
- Person to person contact:
    - Present a poster at Singapore's annual Early Childhood Conference. This Early Childhood conference is a major conference in Singapore for the Early Childhood sector and is attended by principals and teachers. To print the poster, it would cost the author SGD $48 to print a poster on matte paper

(Posters Large Format Printing Services, 2020). The conference fee for the Early Childhood Conference costs SGD $70 (ECC2018, 2020).

Key Messages and Dissemination Activities for the Secondary Audience

The key message of the program is also aimed at secondary audience which includes Early Childhood Development Agency (ECDA), National Institute of Early Childhood Development (NIEC), the Association of Early Childhood Educators Singapore (AECES) and occupational therapists. ECDA is a regulatory and developmental agency in Singapore that oversees the early childhood sector, including key aspects of child development from seven years and under (About Us, 2019). It is an autonomous agency jointly overseen by the Ministry of Education and Ministry of Social and Family Development. ECDA's Continuing Professional Development (CPD) Masterplan lays out the professional development plan for ECE in aims to raise the quality and professional experience of ECE in Singapore. ECE are encouraged to fulfil 20 hours of CPD every year and can choose from a list of courses in the CPD Prospectus which is updated quarterly (CPD Prospectus, 2019). The National Institute of Early Childhood Development (NIEC) is a major training institute in Singapore that provides training to ECE. The NIEC also offers CPD courses in addition to preservice training. Another organization that the key message of the program is important for is the Association of Early Childhood Educators Singapore (AECES), a professional body for ECE in Singapore. AECES also offers CPD courses for ECE and lists their courses on their website.

In efforts to increase the accessibility of the program to ECE, one strategic plan

would be to list the *Handwriting Success for School* program as a Continuing Professional Development (CPD) course with ECDA, NIEC and AECES. These three organizations are trusted and well-respected in the early childhood sector in Singapore. Currently, there isn't a course that aims to train teachers to teach handwriting listed in any of the organization's course list or prospectus. When the program is listed as a CPD course, it increases awareness to the program and the importance of training to teach handwriting.

In addition to targeting ECE, sharing about the program with occupational therapists, at the annual National Occupational Therapy Conference in Singapore, would increase awareness and advocate for occupational therapists to adopt a collaborative consultation approach when working with ECEs and the benefits in investing in teacher training for better child outcomes. Additionally, it highlights the opportunities for occupational therapists to contribute to the PD of ECE in providing a high-quality instruction at the universal, Tier One instruction level. The following are the key messages are for the secondary audience of the program:

- The *Handwriting Success for School* is a professional development program by occupational therapists that equips ECE with the knowledge and skills to be able to provide high quality instruction to teach handwriting confidently. The program would also enable ECE to be able to identify and provide early intervention to children who may need more assistance in mastering handwriting skills in their class.

- The collaborative nature of the program with occupational therapists encourages inter-disciplinary training and learning between ECE and occupational therapists.
- The knowledge and skills of occupational therapists can contribute in the professional development of ECE.

Dissemination activities for the secondary audience:

The following are the dissemination activities in promoting the program to the secondary audiences:

- Person to person contact:
    - An email would be sent to the relevant representatives at ECDA, NIEC and AECES to arrange a briefing of the program. The key messages for the secondary audience will be emphasized in the presentation in bid to convince those at the meeting to consider listing the program in their prospectus or on their website.
    - Poster presentations at the National Occupational Therapy Conference in Singapore. This is an annual conference organized by the Singapore Association of Occupational Therapy. The poster printed for the primary audience would be used for this dissemination activity. Therefore, apart from conference fees, there would not be additional cost. The conference fee costs SGD $500 (Registration, 2019)
- Written information:
    - To supplement the above-mentioned briefing with a printed brief for the secondary audience. The brief of the program will be printed and bound

professionally to be given the individuals present at the briefing. The printing of the brief in A4 size would cost SGD $0.60 per sheet. Estimating that the brief document would have 15 pages in total, the cost to print the document would be SGD $9 per document. The binding of the document with a simple saddle-back stitch would cost SGD$1.50 per book (Binding Services, 2020).

    - Work towards publishing an article about the topic of handwriting development and the contributions of the program in the local Early Educators Journal which is published biannually by AECES (Code of ethics & Early Educators Journals, 2020)
    - Work towards publishing an article about the benefits of inter-disciplinary learning and collaboration between teachers and occupational therapists in the context of the program in Childhood Education: Innovations magazine (Publications, 2020). This magazine is published by Childhood Education International, a well-respected international organization in the early childhood field. The target audience of the magazine is international in childhood filed. The magazine seeks articles that explore new “thinking and innovative practices for education delivery and reform”.

- Electronic media:
    - Childhood Education International has a web platform titled, Innovation Exchange on their website that shares innovative approaches and ideas in education. Brief posts or articles can be submitted where the information would be shared on the organization’s social media or e-news platform.

- Innovation Exchange would be an avenue to share about the benefits of interdisciplinary learning and collaboration between occupational therapists in the context of the aims of the program (Publications, 2020).

Table 6 summarizes the budget of the dissemination plan.

Evaluation of Dissemination Efforts

The success of the dissemination plan would be evaluated by the number of ECE that participate in the program. When the program is listed on the ECDA course prospectus and the NIEC and AECES list of professional development courses, it is anticipated that the number of ECE applying to participate in the program would increase with the increase awareness of the program. In addition to the number of participants, visits to the program's website would also increase as more ECE or interested parties come to know about the program. Approvals to submit in the magazines and journals would show the increased recognition of the program's key messages by the early childhood sector.

Item		Primary Audience	Secondary Audience	Rationale
Written	A4 Flyer	SGD$500 for 1000 flyers (www.ACCEA.sg)	NA	For distribution to the preschools
	A5 Flyer	SGD$330 for 1000 flyers (www.ACCEA.sg)	NA	For distribution at conferences and meetings
	Promotional material	Banner pens (500 pieces) - SGD$215 (www.giftmarket.com)	Banner pens (500 pieces)-SGD$215 (www.giftmarket.com)	For distribution at conferences and meetings
	Article contribution to Beanstalk magazine	Author's time - 8 hours x SGD$33 = $264	NA	For Beanstalk magazine pending approval
Electronic Media	Brief document	NA	Printing and binding of 20 documents for the brief – SGD$210 (www.ACCEA.sg)	For briefing the secondary audiences at the briefing meetings.
	Article for Childhood Education: Innovations magazine	NA	Program designer time - 12 hours x SGD$33 = $369	For outreach to primary audience.
	Website	One year plan – SGD$240 (includes domain name) With GST – SGD$256.80 (www.sitebeat.com.sg)	One year plan – SGD$240 With GST – SGD$256.80 (www.sitebeat.com.sg)	For outreach to primary audience.
	Facebook page	$0	$0	For outreach to primary audience
	Brief post for Innovation Exchange by Childhood Education International.	NA	Program designer time - 8 hours x SGD$33 = $264	For outreach to secondary audience
Person to person contact	Poster	SGD$48 for A0 size poster on matte paper. (www.ACCEA.sg)	SGD$0 (Already budgeted for primary audience)	Used at conferences
	Early Childhood Conference	SGD$70 conference fee.	NA	Access to primary audience.
	National Occupational Therapy Conference	NA	SGD$500 conference fee	Access to secondary audience.
	Email to arrange a briefing with ECDA, NIEC, and AECES.	NA	SGD$0	Outreach to secondary audience.
Expenses		SGD$1923.80	SGD$2054.80	For each audience
Total dissemination expenses		SGD$3978.60		Expenses for both the primary and secondary audiences.

Table 6 – Summary of Dissemination Expenses

Conclusion

PD of ECE is important in supporting the provision high quality instruction in preschool classrooms. High quality instruction is essential for the positive developmental outcomes of preschool children especially children who are identified by the teacher to require additional support in developing their skills. *Handwriting success for school* is a PD program, by occupational therapists, for ECE that aims to equip early childhood educators in Singapore to be able to teach handwriting and to provide early intervention to children who may be struggling to master handwriting. ECE will be the primary audience of the dissemination efforts. Secondary audiences of the program include the Early Childhood Development Agency (ECDA), National Institute of Early Childhood Development (NIEC), Association of Early Childhood Educators Singapore (AECES) and occupational therapists. Dissemination efforts to the secondary audience is key in increasing the access of the program to as many ECE as possible. In reaching out the primary and secondary audience, dissemination efforts will include written materials, electronic media and person-to-person contact with a total expense cost of SGD $3978.60 for a two-year dissemination plan. The long-term goal of the dissemination plan is to be able to equip ECE to provide timely early intervention to children who are identified to be at risk of development delay and for occupational therapists, with their expertise and skills, to contribute to the training of ECE.

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CHAPTER SEVEN: CONCLUSION

Early childhood is a time to build foundational motor, communication, self-care and academic skills for school. Evidence suggests that kindergarteners with better fine-motor skills achieve better academically and children who have poor handwriting were slower at completing their and are at-risk of delays in literacy skills (Cameron et al., 2012; McCarney et al., 2013; Suggate et al., 2019). The benefits of teaching handwriting explicitly include improved handwriting legibility, fluency and word reading skills (Berninger et al., 2006; Satangelo & Graham, 2016). However, teachers may not by differentiating their instruction for children who are struggling with writing and handwriting (Graham & Harris, 2005).

An extensive literature review was conducted to understand the problem and to evaluate existing professional development for teachers that have attempted to address the problem. Handwriting legibility in children is predicted by the teacher's perception of the importance of teaching handwriting, competency to teach handwriting and the duration of handwriting instruction and practice provided in the class (Graham et al., 2000; Graham et al., 2008; Medwell & Wray, 2008). Teachers perceive they lack training to teach handwriting and to support children who have difficulties acquiring the skill (Donica et al., 2012; Hart et al., 2010; Schoenfeld et al., 2009; Wehrmann et al., 2006). This lack of instructional knowledge could weaken the quality of teacher's handwriting instruction (Graham et al., 2008).

Children in Singapore are expected to achieve the ability to write their name and the letters of the alphabet with appropriate speed by the end of kindergarten (MOE,

2013). Although preschool students are taught the basics of handwriting, there is a gap in common standards and handwriting instruction practices among early childhood educators (ECE) in Singapore. Occupational therapists are key professionals in advocating for the development of the fundamental motor skills that preschool children require to prepare them for academic achievement and can help teachers in the area of handwriting instruction (Nye & Sood, 2018). Occupational therapists can contribute to the professional development of ECE in the area of handwriting instruction as their knowledge and skill set in neuromuscular and sensory-motor background can assist teachers in all three levels of the tiered approach (Donica, 2010; Donica et al., 2012).

The *Handwriting Success for School* is a professional development program by occupational therapists that aims to increase the competency of ECE in Singapore to provide high quality core instruction in teaching handwriting and, to identify and support preschool students who are struggling to acquire or master handwriting skills. Adult Learning Theory and the Collaborative Consultation Model guided the development of the program (Merriam & Bierema, 2014; Idol, Paolucci-Whitcomb, & Nevin, 1995). The program has two phases which are a training phase and a support phase. In the training phase, participating ECE will attend two in-service trainings that aims to increase their knowledge and understanding of fine-motor development in preschoolers and evidence-based principles of teaching handwriting. In addition, participants will learn to identify children who are having difficulties acquiring handwriting skills and strategies to support these children. After the training phase, the participating early childhood educators will attend 8 collaborative consultation sessions with an occupational therapist during the

support phase.

Outcomes of the program being measured are the increase in teacher's knowledge, confidence and competence in teaching handwriting and in supporting children who have difficulties acquiring handwriting skills as a result of the in-service workshops and collaborative consultation sessions. Data will be presented via a pre-test and post-test outcome study where quantitative data with using a pre- and post- survey with Likert style questions to measure change in knowledge and perceived confidence and competence.

In summary, the *Handwriting Success for School* program by occupational therapists enables ECE in Singapore to confidently and competently teach handwriting and support students who have difficulties acquiring the skill. By contributing to the professional development of teachers, occupational therapists support ECE to provide high quality handwriting instruction so that every preschool child in Singapore would have the opportunity to receive the support to achieve the expected handwriting skills before entering into primary school.

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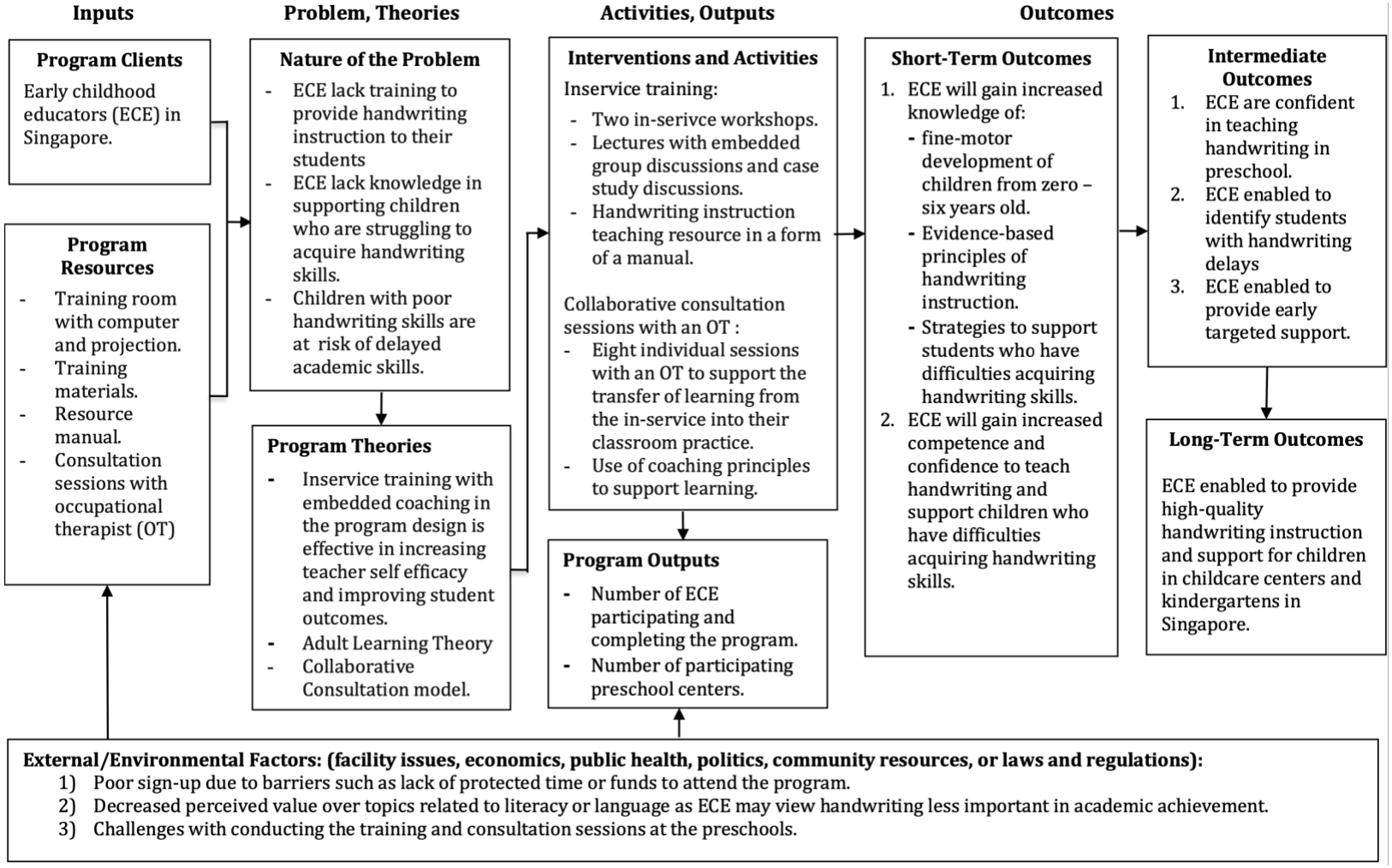
APPENDICES

Appendix A: Logic Model



Appendix B: Executive Summary

Handwriting Success for School: A professional development program for early childhood educators by occupational therapists.

Introduction

A main occupation of students in school is handwriting and handwriting remains a relevant skill as teachers still prefer the medium of handwriting for students to show learning and understanding (McMaster & Roberts, 2016). Recent evidence-based research show that teaching handwriting early leads to better literacy and academic outcomes later in school (Suggate, Pufke, & Stoeger, 2019). Despite the importance of developing student's handwriting skills especially in the younger years, handwriting efficiency is underestimated by teachers in mainstream education (Medwell & Wray, 2008). There is variability in the methods and frequency that teachers teach handwriting in class (Graham et al., 2000; Graham, Harris, Mason, Fink-Chorzempa, Moran, Saddler, 2008) and more concerningly, teachers were found to not differentiate and adjust their teaching to support children who are struggling to write (Graham & Harris, 2005).

A student's ability to have fluent and legible handwriting is predicted by the teacher's competence in teaching handwriting, their attitudes towards teaching handwriting, and the duration of time they spend teaching handwriting in class (Graham et al., 2008). However, teachers feel they are inadequately prepared to teach handwriting and lack the knowledge and strategies to help children who are struggling with handwriting (Hart, Fitzpatrick, & Cortesa, 2010; Wehrmann, Krupa, Cramm, & DeLuca, 2006).

By the end of kindergarten, children in Singapore are expected to be able to write their name and the letters of the alphabet with appropriate speed (MOE, 2013). Despite expectations to possess handwriting skills before entering primary school, there are no common standards for preschool teachers to teach handwriting. The lack of standards could lead to variability in the way teachers teach handwriting in the preschool and in student outcomes (Malpique, Pino-Pasternak, & Valcan, 2017). Therefore, in bridging this gap in the preschool landscape in Singapore, teachers would benefit from professional development opportunities to increase their competencies in teaching handwriting in their class. Occupational therapists with their knowledge in neuromuscular and sensory-motor development are key professionals in providing handwriting instruction training to teachers (Donica, 2010; Donica, Larson, & Zinn, 2012).

Program Overview

Handwriting Success for School is a professional development program by occupational therapists for early childhood educators (ECE) that aims to increase the competency of ECE in Singapore to provide high quality core instruction in teaching handwriting. Tier 1 of the Response to Intervention model places emphasis on teachers being the main personnel in supporting children's participation in the classroom (Bayat, Mindes, & Covitt, 2010). The program offers professional development opportunities for ECE in Singapore to be competent in providing Tier 1 support to children identified to be at-risk of fine-motor and handwriting delays.

The program has two phases: Phase 1-training and Phase 2-support. In the training phase, participating ECE will attend two half-day in-service trainings that aims to increase their knowledge and understanding of fine-motor development in preschoolers and evidence-based principles of teaching handwriting. In addition, participants will learn how to develop handwriting instruction goals, plan for a targeted solution, and learn to monitor for progress in supporting their student's handwriting skills. After the training phase, the participating early childhood educators will receive 8 collaborative consultation sessions with an occupational therapist during the support phase. With the use of the collaborative consultation model, the occupational therapist will support the ECE to translate their knowledge gained at training into their daily class instruction. A collaborative approach encourages ECE to apply their knowledge and skills, which can increase their teacher self-efficacy and increase positive outcomes in the children.

Theoretical Frame of Reference

The program incorporates principles of Adult Learning Theory, coaching and collaborative consultation model in the design of the program (Merriam & Bierema, 2014; Idol, Paolucci-Whitcomb, & Nevin, 1995). Adults engage in self-directed learning for self-fulfillment, problem-solving and greater competency in life roles (Merriam & Bierema, 2014). In view that teachers desire to be equipped to teach handwriting and to support children who are struggling to develop handwriting skills, the program provides a timely professional development opportunity for teachers to improve their instructional practice in this area. Professional development for ECE improves the quality of

pedagogical practice which in turn, improves developmental outcomes in young children (Egert, Fukkink, & Eckhardt, 2018).

The evidence-based literature supports that coaching is effective in supporting teachers translate knowledge to practice in working towards supporting her students in class in comparison to traditional professional development in the form of stand-alone trainings and workshops (Kretlow & Bartholomew, 2010; Schachter, 2015). Coaching and collaborative consultation have a common goal which is to support teachers in "improving the quality of education received by students, particularly students who struggle to learn" (Denton & Hasbrouck, 2009, p. 168). A collaborative setting encourages successful adult learning as the person receiving the coaching is provided the opportunity to choose the learning goals that would like to focus on (Beavers, 2009). The collaborative consultation model is a triadic model where the consultee, i.e. the teacher, is the mediator of change between the consultant, and to the individual where change is sought, i.e. the student (Idol, Paolucci-Whitcomb, & Nevin, 1995). The benefit of the collaborative consultation model is that it encourages inter-disciplinary sharing for the positive outcomes of the student (Idol et al., 1995). As collaborative consultation is usually conducted on an individual level, the learning climate is supportive to the teachers as adult learners.

Assessment and Outcome Measures

The success of the Handwriting Success for School program in increasing the competency of ECE to teach handwriting and support children with difficulties mastering

handwriting will be evaluated at each phase of the program. An evaluation will be done post-training, at the end of the support phase and 3 months' after the program to evaluate if the gains made by the teacher was sustained after the program.

At the training phase, outcomes being measured are changes in ECE's knowledge in the topic area of handwriting and supporting children who have difficulties with handwriting. Data will be collected via pre- and post-training survey with Likert style questions to measure change in knowledge. At the support phase, outcomes being measured are changes in the ECE's sense of competence and confidence in teaching handwriting and supporting children who may require support. Data will be collected via pre- and post-survey with Likert style questions to measure change in the ECE's sense of competence and confidence. All the data are collected virtually via password-protected account in Google Forms. After the data has been collected, the data will be downloaded into an Excel format and stored in an encrypted data storage disk. The responses will be deleted from Google Forms once the information has been downloaded.

Program Funding

Program development and implementation requires resources that includes time, materials, personnel and financial resource. Potential funding sources to cover the anticipated expenses may include grants by the National Council of Social Services or by the Early Childhood Development Agency in Singapore. Expenses associated with the planning, implementation and dissemination of the program include the cost of developing the training materials, costs associated with hiring occupational therapists to

conduct the training and coaching sessions and costs for the provision of training materials. The cost to start the implementation of the program in the first year would be SGD $3983 and to run the program twice a year would cost SGD$2808. Dissemination cost of the program would amount to approximately SGD$3978.60. As most of the purchase of equipment is budgeted for the first year, the cost to run the program would decrease after the first year. The subsequent cost is to cover for the expenses to conduct the program for the ECE.

Conclusion

Handwriting Success for School: A professional development program for Early Childhood Educators offers ECE in Singapore access to training that supports them to be competent and confident to teach handwriting to preschool children. The program would also raise their competence and confidence to support children who have difficulties learning handwriting. By raising the quality and standards of teacher's ability to teach handwriting, it provides all preschool children equal opportunities to develop the necessary handwriting skills to be successful in primary school and beyond.

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Appendix C: Fact Sheet

BOSTON UNIVERSITY

***Handwriting Success for School*: A professional development program for early childhood educators by occupational therapists.**

Gloria Ng Siok Kwan, BOT, OT
OTD Candidate

Clinical problem

Picture credit: http://startwrite.com/idea-for-teachers

- Students' ability to handwrite fluently and legibly is predicted by the teacher's competence, attitude, and how much time they spend teaching handwriting (Graham, Harris, Fink-Chorzempa, Moran & Saddler 2008).
- Teachers perceive themselves to be inadequately prepared to teach handwriting and feel they lack knowledge and strategies to help children who are struggling with handwriting (Hart, Fitzpatrick, & Cortesa, 2010; Schoenfeld, Coppola, Kertis, & Barnes, 2009).

Expectations and handwriting instruction in Singapore preschools

- Kindergarten children are expected to be able to write their name and the letters of the alphabet with appropriate speed before they enter primary school education (MOE, 2013).
- There is a lack of standard in handwriting instruction across preschools which leads to unequal opportunities for children to receive the support in developing their handwriting skills before entering into primary school.

Picture credit: https://en.clipdealer.com/photo/media/A-100777462

Handwriting Success for School

Training
- 2 in-service training sessions
- Provision of training materials, group activities & handwriting instruction guidebook.

Support
- 8 collaborative consultation sessions with occupational therapist
- Key activities include classroom observations and feedback discussions.

- A professional development program for early childhood educators by occupational therapists that aims to increase the competency of teachers to teach handwriting and support children who struggle to master handwriting.
- The program incorporates principles of Adult Learning Theory and Collaborative Consultation model.
- Collaborative consultation sessions with an occupational therapy practitioner allows teachers to translate skills gained at training into their teaching practice.

Theory and Evidence-base

Adult Learning Theory

- Adults' learning needs and interests relate to their social roles and the responsibilities that come with the roles they perform (Merriam & Bierema, 2014).
- Effective training of teachers incorporates principles of Adult Learning Theory (Beavers, 2009).
- Professional development for teachers has a positive impact on teacher's self-efficacy and on students' outcomes (Egert, Fukkink, Eckhardt, 2018).

Collaborative Consultation Model

- Coaching is effective in supporting teachers to translate knowledge to practice in working towards supporting their students in class (Schachter, 2015).
- The benefit of the collaborative consultation model is that it encourages inter-disciplinary sharing for the positive outcomes of the student (Idol, Paolucci-Whitcomb, & Nevin, 1995).

Picture credit: www.ct3education.com

Impact on Occupational Therapy:

- Occupational therapy practitioners' comprehensive training and expertise makes them key professionals to contribute to the professional development of teachers in increasing their quality of handwriting instruction and supporting children who have difficulties developing handwriting skills (Donica, 2015).
- Occupational therapists have a distinct role in supporting teachers in providing high quality Tier 1 support to promote children's participation in school.

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